WAKE CONTROL MECHANISM

REFERENCES CITED

6,505,572	Jan., 2003	Seipel, et al.
6,234,099	May., 2001	Jessen, et al.
5,787,835	Aug., 1998	Remnant
5,549,071	Aug., 1996	Pigeon, et. al
5,263,432	Nov., 1993	Davis
4,896,622	Jan., 1990	Thomas

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX

Not Applicable

FIELD OF THE INVENTION

The invention relates to a plate, typically behind a boat's transom to increase wake size, and/or modify wake shape

BACKGROUND OF THE INVENTION

Because wakeboarders like big wakes, boats built for wakeboarding usually now have water tanks, called bladders, installed near the back of the boat to increase boat weight or "displacement" and thus increase wake size. Patents cover various bladder configurations. One patent covers a totally different method of modifying a boat wake by placing a flat plate (called a "trim tab") at the bottom-center of the transom. This method can change the shape of the wake, but it is not intended or effective for increasing wake size, because trim tabs raise the

back or "stern" of the boat and thus reduce wake size. Before I/O boat motor drives included automatic tilt controls, "trim tabs", as shown in FIG.1, were often installed on the bottom outside edges of the transom, to adjust not only the "trim" or bow/stern angle but also the list or port/starboard tilt. Most trim tabs are hydraulically controlled so that the driver can adjust the tilt of the boat while underway with a toggle switch. At slower speeds, when the bow tends to ride too high, the tabs are lowered, thus deflecting the water leaving the back of the boat downward and so providing lift to the back of the boat and lowering bow or "trim." If the boat is listing to one side, the trim tab on that side can be adjusted lower until there is no more sideways tilt. (Control mechanisms, typically hydraulic, for adjusting trim tabs have been in use for over 50 years and are not a part of this invention).

BREIF SUMMARY OF THE INVENTION

The present invention achieves the same lowering of the boat rear that is achieved by a bladder, but without the added weight. The invention accomplishes this with one or more wake control plates, hereafter called plates, which look similar to normal trim tabs, but they have the opposite effect of trim tabs used so far, because: 1) the plates which are the subject of this patent are mounted so their front edge can be below the top surface of the flow of water beneath the hull of the boat versus normal trim tabs which are flush with the bottom of the hull, and 2) the plates are tilted up (back end higher than front edge) instead of down (back lower than front edge) so that the water can be scooped up instead of pushed down. This has the effect of forcing the back of the boat deeper into the water, just as added weight does, instead of lifting the stern as a normal trim tab does. The main advantages are: relatively little weight is added to the boat; more rapid adjustability; greater control of wake size; the plates can be adjusted to create different wake shapes compared to bladders which merely increase wake size; and the plates have dual use because they can be positioned so as to act like traditional trim tabs thus eliminating the need for normal trim tabs. No other inventions or designs found in patent searches describe plates or anything else designed to have negative lift by a water-scooping action.

The plates may be any size and may be connected to the stern and adjusted to various positions in a variety of ways, so that the front edge of the wake control plate(s) can be submersed in the water flowing past the boat, under the hull, behind the stern and/or to the sides of the stern, at an

angle which provides a scooping action...the opposite of the lifting action of normal trim tabs. Additionally the plates may have walls allowing the water scooped up by the plates to accumulate above water level, thus increasing wake size by adding weight. It is the water scooping effect which is the object of this invention, regardless of what portion of the plates are in front, beside or behind the stern.

BREIF DESCRIPTION OF THE DRAWINGS

Items in the drawings are labeled as follows:

"B" is a boat or watercraft;

"T" is the transom (the back face of the boat);

"P" is the plate or wake control mechanism;

"A1", "A2", "A3" are arms whose length can be adjusted;

"JJ" is a joint which swivels on one axis of rotation;

"J" is a joint which swivels on one axis of rotation and which can twist about the orthogonal axis up to approximately 20 degrees;

"CL" is a control lever in the hydraulic system to activate adjustable arms;

"V" is a valve in the hydraulic control system;

"HP" Is the hydraulic pump in the hydraulic control system; and

elements whose label is predicated with an "S" are screw, clip, pin or other mechanical attachment points, that also are "JJ" joints.

FIG. 1, a side view of the prior art, is a boat equipped with trim tabs that are hinged at the front edge. The front edge is thus fixed to remain flush with the hull and the front edge cannot extend below the bottom of the boat.

FIG. 2A , the preferred embodiment, is a side view of a watercraft with a flat wake control plate connected to the stern by three length adjustable arms. The two front arms labeled "A1" and "A2" are solidly attached to the transom so that the front of the plate can only move horizontally as the arms lengthen or shorten. Arms "A1" and "A2" are hinged where attached to the plate and arm "A3" is hinged at both ends so that the bow/stern angle of the plate can be adjusted by varying the length of arm "A3."

FIG. 2B is a stern view of the same configuration as FIG. 2A

FIG. 2C is the same configuration as FIG.2A with the plate in the closed/non-functioning position.

FIG. 2D is the top view of the same configuration as FIG.2A.

FIG. 3 is the same configuration as FIG.2A except that the plate is curved upwards.
FIG. 4 is the same configuration as FIG. 2A except that the plate has side and back walls to hold the water that is scooped up by the plate.

FIG. 5 is a stern view of a V-bottomed boat equipped with two wake control plates, which are shown, optionally, set at different tilt angles (by adjusting the same arms shown in FIG.2A). This configuration works for boats with outboard motors or I.O. drives that occupy the middle area of the transom.

FIG. 6A is a side view showing a plate connected to the stern by nonadjustable arms at the front and one adjustable arm.

FIG. 6B is a stern view of the same configuration as fig 6A.

FIG. 6C is the same configuration as FIG. 6A except with two plates.

FIG. 6D is the same configuration as FIG. 6A, FIG. 6B and FIG. 6C except that the front joints may be attached, by hand, at different places on the transom. The top attachment location (S1) allows the plate to act as a normal trim tab because the front of the plate is flush with the bottom of the boat.

FIG. 7 shows a plate which has no motor powered adjustable arms. The plate is moved from the inactive/up position to the active/down position by manually changing the attachment points of arm "A3" and/or by adjusting the length of arm A3.

FIG. 8 shows one means of hydraulic control for adjusting the length of the arms. This configuration is when "A1" and "A2" remain equal to each other in length.

FIG. 9 shows a means of hydraulic control where in addition to moving the front of the plate up and down, the plate can be tilted sideways by adjusting "A1" and "A2" to be different lengths.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiment of the present invention is for boats that do not use an inboard-outboard or outboard engine and is depicted in FIG. 2A – FIG. 2D. The wake control plate "P" is connected to the transom "T" of the boat "B" by adjustable arms "A1", "A2" and "A3". Adjustable arms "A1" and "A2" are mounted rigidly on the Transom "T" and can only extend or contract vertically. "A1", "A2" and "A3" are connected to wake control plate "P" with a non-rigid joint "J", where a non-rigid joint is a connection that allows the arm 360 degrees of angular flexibility in one plane and up to approximately 20 degrees of angular flexibility in the direction perpendicular to that plane. (An example of a non-rigid joint that rotates 360 degrees in one direction and up to 20 in the other is the rubber gasket joint typically used on the bottom end of automobile shock absorbers). Non-rigid joints give the wake control plate the flexibility to tilt about any axis as the length of the adjustable arms are independently adjusted, although the front two arms "A1" and "A2" are typically adjusted in concert. Adjustable arm "A3" may be attached to the transom of the boat "T" by means of non-rigid or preferably rigid joint "JJ". In the preferred embodiment, the front edge of the plate, when in the active position, is about 5 cm below the transom and tilted about 20 degrees upward from the plane of the hull and, in the inactive position, the front of the plate is raised to be flush with the hull. In the inactive position the plate may be tilted down, thus acting like a normal trim tab to raise the back of the boat. (for boats with outboard motors or IO drives, two separate plates on either side of the drive, as shown in FIG.5, or a single plate with a cutout may be used.)

Another embodiment or variation is to use a plate which has an upward curve as shown in FIG. 3. Just as a curved wing is more efficient at creating lift with less drag, a curved plate is more efficient at producing negative lift with less drag. Two disadvantages of this variation are the added expense of manufacture and the optimum amount of curvature varies with boat speed. Optionally, additional efficiency improvement is achieved by also varying the thickness of the curved or flat plate, just like a wing varies in thickness.

Another variation is to have a fixed distance that the plate extends below the bottom edge of the transom. This variation, shown in FIG. 6A – 6C, is lower cost because "A1", "A2" and their associated control mechanisms are eliminated.

An even lower cost variation, as shown in FIG.7, is a plate which is held in position by arms which are not adjustable during use. In FIG.7, points "S1" through "S8" are positions where the arms can be snapped, hooked or screwed or otherwise connected to the transom. "S1" is the inactive position and "S2" through "S8" are the active positions with varying amounts of water scooping/deflection action. This configuration is expected to be more popular when retrofitting existing boats, where the cost of installing hydraulics and control-panel switches is greater than when factory-installed. For the configurations shown in FIG. 6- FIG. 7, the "fixed distance" that the plate extends below the hull is, of course, hand adjustable, for example by having different locations on a transom-plate where the hinges may be attached ... including locations where the plate is flush with the hull bottom.

Arm "A3" may be connected anywhere on the plate, except along a line between "A1" and "A2", however somewhere between the middle and back edge provides the best combination of strength and lower manufacturing cost. Similarly arms "A1", "A2" and "A3" may be attached anywhere on or near the back of the boat, so long as the positions do not hinder movement of the plate. Also the plate(s) could be positioned so that part or all of the plate(s)is/are in front of the stern, either beneath or beside the transom.

FIG. 5 is a more expensive embodiment for boats with V or U shaped hulls and for boats equipped with outboard or inboard-outboard engines. However the implementation shown in

FIG.5 also works with boats driven by inboard motors and provides more flexibility in creating different wake effects than a single plate implementation

For any configuration shown, plates may be curved in the sideways direction to match the V, U or other shape of the bottom of the transom. When more than one plate is used, the controls may allow for separate adjustment of each plate or one or more plates may be simultaneously adjusted by a single control mechanism or, for any number of plates, each arm may be independently adjustable. Substitutions of elements from one described embodiment to another and logical amendments and appendages to each embodiment are also fully contemplated. It is also to be understood that the drawings or the aspects of each drawing are not necessarily drawn to scale, but are used to visualize the concepts covered herein.

37 CFR 1.27
Declaration of Small Entity Status

I, Steven Clay Moore, claim small entity status.

Steven Clay Moore